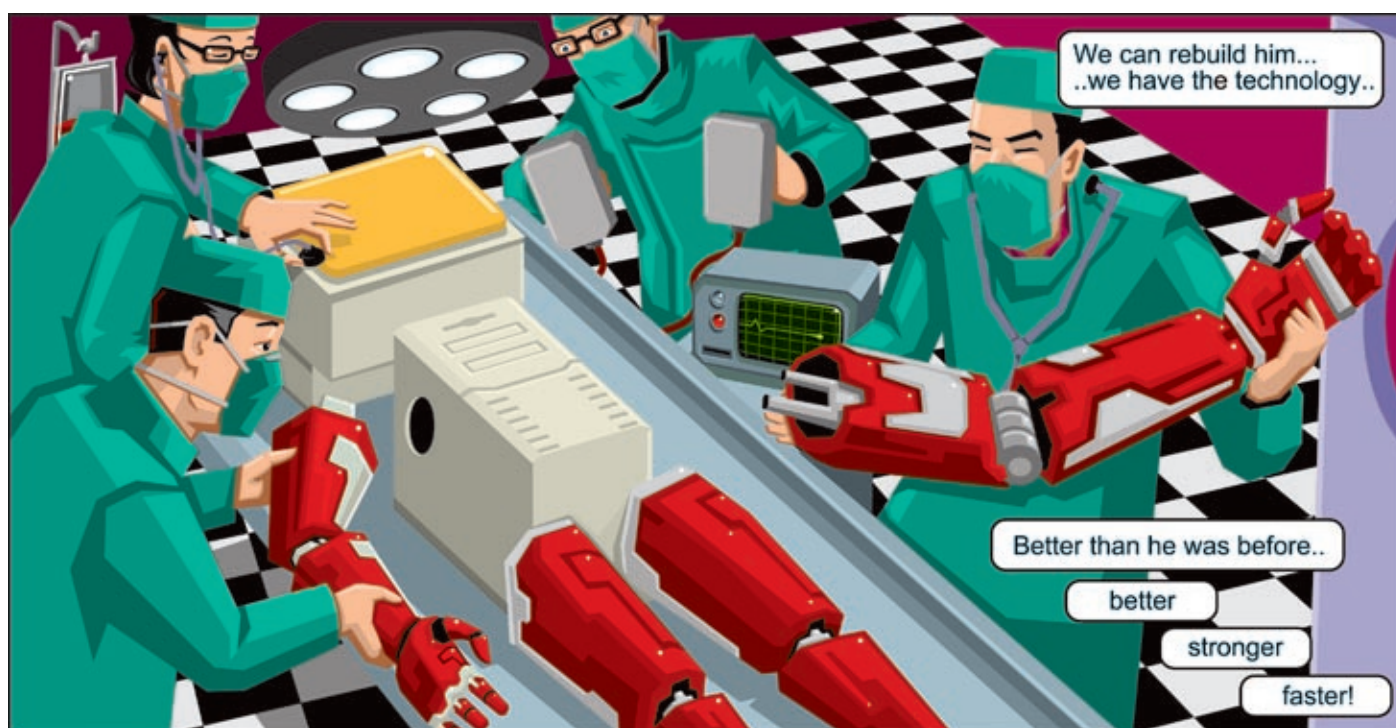




OPTIMISE YOUR PC FOR GAMING

Your PC may not be the flashiest computer around, but that doesn't mean you can't enjoy the latest games.

Chris Finnamore explains the tweaks that can turn a modest system into a respectable gaming machine

You may have bought your PC with the noble intention of using it only for work, but your mind has wandered to games. Or perhaps it's the opposite – you've invested a fortune in the best games PC available, and email is just an irritating distraction from your leisurely pursuits.

Either way, if your system is more than a few months old, you've probably noticed that PC gaming is a mixed blessing. The PC's open-ended design means you have access to the latest innovations; you won't find SLI, multi-gigahertz processors or even high-resolution graphics on a PlayStation 2. However, the downside of this continuous innovation is that, before long, your once-lightning fast PC begins to struggle with the latest games.

You can't just throw money at the problem, either. PCs are complex devices, and the processor, graphics card, motherboard, RAM, hard disk and countless other components affect performance. This makes it hard to work out whether your PC is capable of running a game, and when you find one it can't run, it's just as tricky to work out what to do about it. It's often tempting to give up and buy a new PC. However, this isn't always necessary.

GAME ON!

We've gathered three PCs, one each from 2001, 2003 and 2004. This should cover the hardware you're likely to have in your computer. We've

looked at each PC's capabilities as they stand, then tried various upgrades and driver tweaks in an attempt to get our current crop of favourite games – Doom 3, Far Cry and Splinter Cell: Chaos Theory – running smoothly. We've experimented with game quality settings and screen resolutions, and tried upgrading each PC with our current top choices of AGP graphics cards: a 256MB ATI Radeon X700 Pro, which currently retails for around £110, and a 128MB nVidia GeForce 6800, which costs around £150.

We didn't upgrade the PCs' RAM. Our experience is that today's games are fine with the 512MB that all three PCs already have installed. There are a few exceptions. If you want to play Battlefield 2 with 63 other players, for example,

we'd recommend upgrading to 1GB of RAM. We also considered processor upgrades, but in all but one of the systems this wasn't particularly viable.

We thoroughly tested each system, paying attention to the number of frames per second (fps) that each computer could generate. As a normal TV signal is 25fps, it's reasonable to assume that any game running at an average frame rate of 25 or more would play smoothly. Unfortunately, it's not that simple in practice. First-person shooters such as Doom 3 vary widely in performance depending on how complicated the scene is. An average of 25fps means that certain scenes, populated with lots of characters and explosions, would stutter to an unplayable level. Realistically, an average frame rate of 40fps or above is necessary.

By contrast, a game such as Splinter Cell is fine with an average of 30fps. This stealth-based game is slower moving, has fewer complex images to draw and its less frantic action means that it's still playable at lower frame rates. Purely tactical games such as real-time strategy titles remain playable at even lower frame rates, although it won't be the most rewarding experience.

So can some canny driver tweaks get your lethargic PC back up to speed or is it time for an upgrade, and if so, what do you add? We've done the testing for you; just turn to the PC that best matches your own hardware and reap the rewards of our investigations.



▲ The AGP versions of ATI's Radeon X700 Pro and nVidia's GeForce 6800 performed well in last month's Labs, making them ideal choices when upgrading



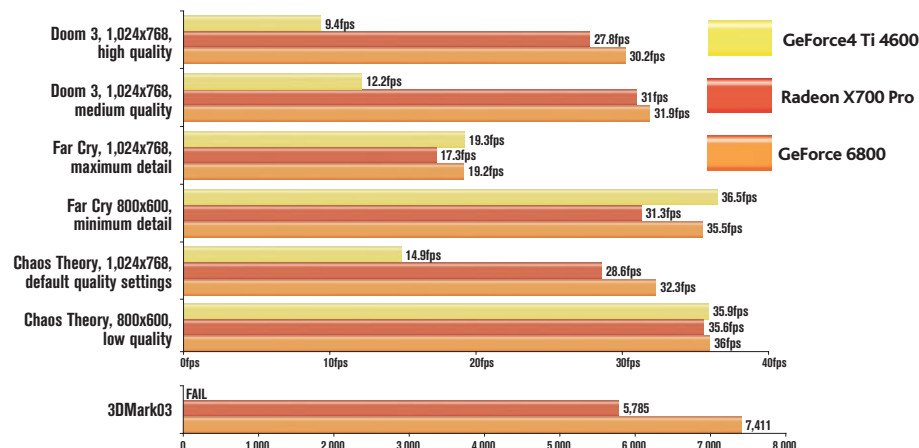
In 2001, the combination of the Athlon 1.4GHz processor and GeForce3 graphics card was powerful enough to breeze through titles such as Half-Life, Unreal Tournament and Max Payne. But just 18 months later, that £300 graphics card was already showing its age and was replaced with a GeForce4 Ti 4600. This PC has struggled on since then, but is crippled by games such as Doom 3.

Socket A processors such as the Athlon 1.4GHz are no longer in production, so unless you're willing to rummage around second-hand stores or eBay, a processor upgrade is tricky. You may still find the last stocks of Socket A Sempron processors on sale, but our motherboard doesn't support the chips' 333MHz frontside bus.

A graphics card upgrade is more realistic, but we've also experimented with quality settings to see if games would run at acceptable frame rates.

BENCHMARKS

Upgrading the graphics card gave a significant boost to frame rates in Doom 3 and Chaos Theory, but not by enough to give a satisfying gaming experience. Strangely, graphics upgrades were ineffective in Far Cry.



DOOM 3

Doom 3 uses complex lighting and shadow effects. Our ageing PC managed only 9.4fps at 1,024x768 resolution with high detail settings. By dropping the settings to 800x600 and low detail, the frame rate improved to 24.7fps, but this is still jerky and these settings hardly do the game justice.

A Radeon X700 Pro improved matters greatly, with a jump to 27.8fps in our standard test. This is still less than we wanted, though, and dropping the quality settings had little effect on the frame rate. Medium detail at 1,024x768 gave a barely playable rate of 31fps, and dropping the resolution had no effect at all. We had reached the processor bottleneck, where the Athlon 1.4GHz could no longer create the game world fast enough for the graphics card to render it. This was confirmed when we tried a more powerful GeForce 6800 graphics card, which gave barely any improvement.

FAR CRY

We had some surprising results in the Far Cry game test. Even at high-quality settings and 1,024x768 resolution, Far Cry seemed to be challenging the processor far more than the graphics card. The original components managed a jerky 19.25fps, but the powerful GeForce 6800 gave no improvement, with a result of just 19.2fps. Once again, the processor was the limiting factor.

We had much better results when turning down the resolution and detail settings. At 800x600 and minimum detail settings with the GeForce4 Ti 4600 card, the frame rate jumped to 36.5fps, which is enough for reasonably smooth gaming. Unlike most games, Far Cry seems to rely on the processor rather than the graphics card for its visual effects; there was no speed improvement after fitting the X700 Pro or the GeForce 6800 graphics cards.

CHAOS THEORY

Like Doom 3, Chaos Theory is full of impressive lighting effects so is more graphics card-intensive than Far Cry. Our standard setup managed only 14.9fps at 1,024x768 in high quality. But by reducing detail levels to their lowest settings, we saw a playable 32.6fps with the standard card.

Upgrading to the X700 Pro almost doubled the frame rate to 28.6fps, but there was still a noticeable slowdown in the more complicated sections of the

benchmark. To play Chaos Theory smoothly with all the effects turned on, you need to spend a bit more on an nVidia GeForce 6800 card. This gave us 32.3fps, which is good enough.

VERDICT

This system's processor is too outdated to reap the full benefit of a graphics card upgrade. Nothing we tried could produce a playable frame rate in Doom 3. Far Cry became just about playable once we lowered the resolution and quality settings, but the processor bottleneck meant that graphics card upgrades made no difference.

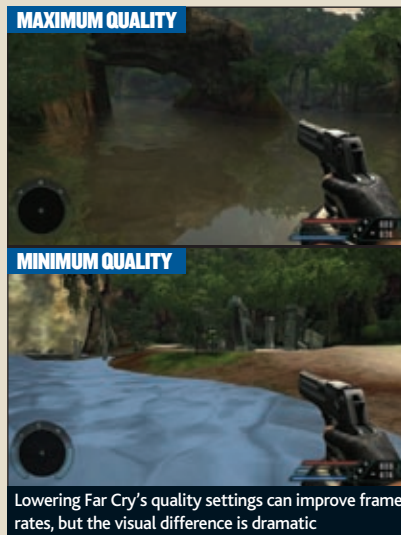
Upgrading to a £150 graphics card enabled us to play Chaos Theory at a reasonable speed, but this is the only one of our games where an upgrade proved to be worthwhile. With a system such as this, you must either stick with what you have or splash out on a huge upgrade job: new processor, motherboard, RAM and graphics card. It might be easier just to get a new PC.

QUALITY SETTINGS

If hardware upgrades are impossible or uneconomical, you may be able to play smoothly by altering the resolution and quality settings. Lowering a game's resolution is a good start. This means fewer pixels for the graphics card to draw each frame, which will make its job easier, but it won't help with processor bottlenecks. Games can still look reasonable on a 17" CRT monitor at 800x600, but on a 17" TFT objects start to look blocky.

Many games have a baffling array of quality settings. How these affect a PC's performance will vary from game to game. Lowering the water and reflection settings in Far Cry can make a great difference to performance, but the water itself takes on an artificial sheen. Turning off specular lighting in Chaos Theory also provides a jump, but it makes the lighting look unrealistic.

If your processor is struggling to keep up, reducing the draw distance in games will ease its workload, as well as that of the graphics card. The downside is that objects will suddenly pop into existence as you get close to them, which isn't the most lifelike gaming experience.





Pentium 4 2.53GHz

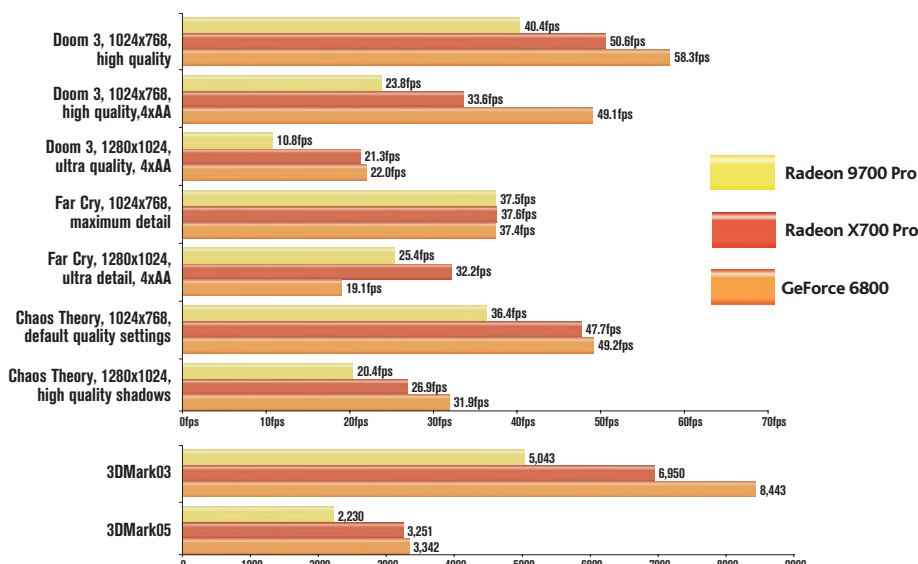
BOUGHT March 2003
ORIGINAL PRICE £1,585 inc VAT

BASE SPECIFICATIONS Pentium 4 2.53GHz,
512MB RAM, 128MB ATI Radeon 9700 Pro

The Intel Pentium 4 2.53GHz processor is still a decent chip by modern standards. ATI's Radeon 9700 Pro was revolutionary when it was launched; its performance was leagues ahead of the competition, and it was the first card to support all the features of DirectX 9. The upshot was that gamers could play Command and Conquer Generals with all the fancy effects turned on or Grand Theft Auto III at maximum draw distance. It is still a fairly powerful card today, so we had high hopes that this mid-range system would still hold its own in our benchmarks.

BENCHMARKS

Despite being well into its third year of service, this PC managed to run all our games at acceptable frame rates with its original graphics card. However, upgrading allowed us to increase the resolution and quality settings.



The 2.53GHz processor is a Socket 478 chip running on a 533MHz frontside bus. Although Socket 478 processors go up to 3.2GHz, anything faster than a 2.8GHz Pentium 4 requires an 800MHz FSB. A 2.8GHz Pentium 4 still costs over £100, which is a lot to pay for 266MHz more. We decided to limit our attention to graphics card upgrades.

DOOM 3

This PC managed a smooth 40.4fps in our standard Doom 3 test with high detail settings, so it can just play Doom 3. It came unstuck when we decided to switch on 4x anti-aliasing; smoother visuals were accompanied by a jerky 23.8fps frame rate.

Installing the X700 Pro made a big difference in the anti-aliasing test, but 33.6fps is still barely smooth enough for a fast-paced shooter such as Doom 3. If you want to eliminate jagged edges, you'll have to upgrade to a more powerful card. While the Radeon X700 Pro gave a slightly jerky frame rate, the nVidia 6800 managed a silky smooth 49.1fps to match the smoother visuals.

FAR CRY

As with our 1.4GHz Athlon PC, the high-quality Far Cry test was limited by the speed of the processor. The game was playable on our base system with 37.5fps, but upgrading the graphics card gave the same score. The Radeon X700 Pro improved slightly in the ultra-quality test from 25.5fps to 32.2fps, but the game was jerky at times. Bizarrely, the more expensive GeForce 6800 could hardly cope with the ultra-quality settings, giving a worse result than the original Radeon 9700 Pro.

Far Cry will play well on a system of this age, and there's no benefit in upgrading the graphics card just for this game. However, our other tests showed there are still reasons to buy a faster card.

CHAOSTHEORY

As this is a fairly slow-moving game, 30fps is adequate for smooth game play. Our standard PC rendered 36.4fps in our high-quality benchmark test, which is representative of the challenges your graphics card would encounter in the game.

Upgrading to the Radeon X700 Pro gave a 10fps boost, ensuring the game would play smoothly at all times, but upgrading further to the GeForce 6800 made hardly any difference. However, the 6800 was the only card to score over 30fps in the ultra-quality test, so if you want the absolute best quality shadows, lighting effects and textures, this is the upgrade to go for.

VERDICT

Even with the standard card, this is a decent gaming machine. All our games had playable frame rates at good levels of visual quality, but if you want to turn on anti-aliasing in Doom 3 or run Chaos Theory at maximum quality, it is worth upgrading to the GeForce 6800. This card should also help keep the next generation of games running smoothly.

If you just want to play Far Cry, however, you are best off sticking with what you already have, as the only way to make the game run faster is to invest in a new motherboard and processor.

ANTI-ALIASING AND RESOLUTION

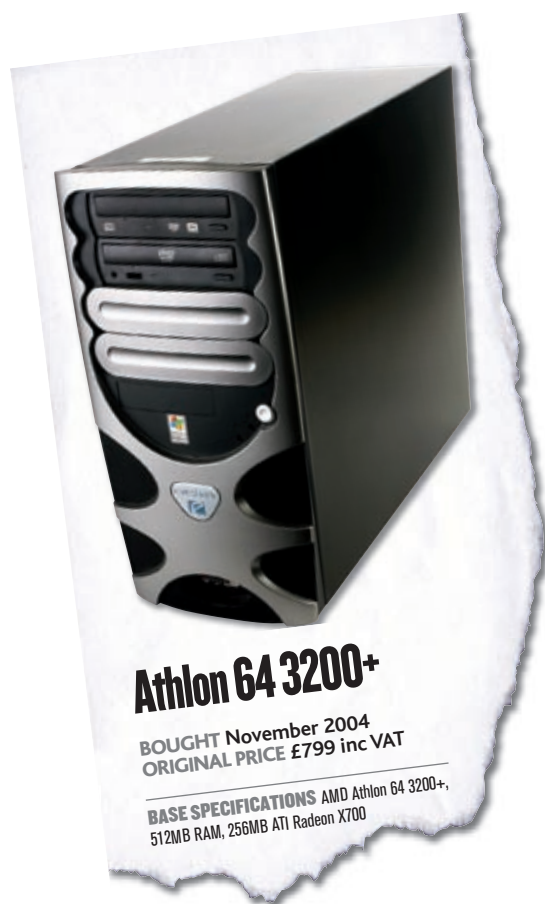
Two of the chief advantages of having a more powerful graphics card are the ability to use anti-aliasing and – if you have an LCD monitor – to play games at your screen's native resolution.

CRT monitors cope well with a range of resolutions, but LCD displays have a fixed number of pixels. This means they can't display resolutions higher than their number of pixels, but also that resolutions lower than native appear blurred, as three pixels struggle to display two equal-sized dots. Therefore, if you're using an LCD screen you should aim to run games at their native resolution, and for this you may need a more powerful graphics card.

Computer displays are good at displaying horizontal and vertical lines, but not so good with curved surfaces and diagonals. This leads to jagged edges, which is where anti-aliasing can help. It creates an image that's typically four times the screen resolution, then blends these pixels in groups to find the average colour for each pixel shown onscreen. The result is that diagonal lines are softened, turning jagged edges into subtle mid-tones and vastly improving visual quality. However, anti-aliasing uses a huge amount of graphics power, so only the most powerful cards can run it. There's no point turning on anti-aliasing if you have an LCD, unless you're running it at its native resolution.



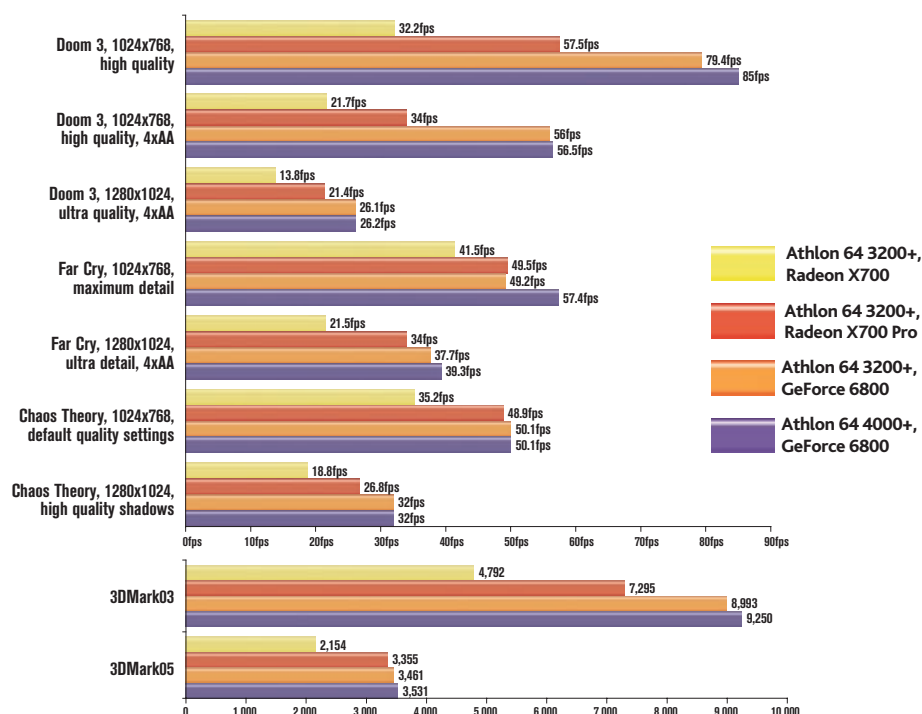
The right side of this screenshot has 4x anti-aliasing switched on; the left side does not. The difference is obvious along the edges of the plane's wings



This PC is less than a year old, but it wasn't really cut out to be a serious gaming machine. The Athlon 3200+ processor and Radeon X700 graphics card were mid-priced components at the time, but they still crop up in budget PC systems. In fact, if you're contemplating a processor, motherboard and RAM upgrade, it's worth considering this setup: the Athlon 64 3200+, Socket 939 motherboard and two 256MB PC3200 DIMMs currently come to around £220.

BENCHMARKS

The original Radeon X700 graphics card seriously hampered this otherwise powerful PC. Graphics card upgrades delivered huge improvements in our Doom 3 tests and even Far Cry ran more smoothly. A processor upgrade also boosted performance in Far Cry but made little difference in Doom 3 and none at all in Chaos Theory.



We thought this system would run our tests at playable frame rates, but we weren't expecting spectacular performance. However, we were surprised at how poorly it fared compared to the 2.53GHz Pentium 4 system. Although its Radeon 9700 Pro was a high-specification card, it's from the previous generation to the X700. Nonetheless, before any upgrades the Athlon 64 PC was beaten by the Pentium 4 in every test except Far Cry. ATT's Radeon X700 is not up to playing modern games.

DOOM 3

Performance in Doom 3 was disappointing. It ran our high-quality test at only 32.2fps, so the game was noticeably jerky in sections. It is possible to run the game without an upgrade, though. Keeping the resolution at 1,024x768 but dropping the quality settings to medium gave us a respectable 42.6fps.

Our frame rate in the standard test with the Radeon X700 Pro jumped to a smooth 57.5fps with high-quality textures, so if you don't want to compromise on visual quality this is a worthwhile upgrade. The X700 Pro couldn't quite cope with anti-aliasing to eliminate jagged edges; the frame rate dropped to a sub-standard 34fps. The GeForce 6800 is the best choice; the combination of our test machine's Athlon 3200+ and the 6800 gave a 56fps result. If you want to run Doom 3 in all its glory, it is definitely worth upgrading to the GeForce 6800.

FAR CRY

This was the only PC where graphics card upgrades made any difference in Far Cry, showing that for once the processor was not the limiting factor. High-quality settings and a resolution of 1,024x768 produced a playable 41.46fps with the standard card. However, once we fitted the Radeon X700 Pro, the frame rate jumped to 49.5fps, and the

game remained just about playable with ultra-quality settings and anti-aliasing turned on.

However, we saw no improvement in the high-quality test after fitting the GeForce 6800, showing that we had once again reached the limit of the processor's capabilities. The 6800 did give us another four frames a second with ultra-quality settings. Far Cry will run fine on our standard setup, but the GeForce 6800 is the best choice for smooth visuals at a 17" LCD's native resolution.

CHAOS THEORY

Chaos Theory stresses the graphics card more than the processor, so we were expecting similar results as in our Doom 3 tests. However, the Athlon 64 PC's Radeon X700 card performed much better in this test than in Doom 3. In our high-quality test we saw a playable 35.2fps, which is comparable to the Pentium 4 PC's 36.4fps result. Upgrading to the Radeon X700 Pro gave an identical result to the Pentium 4's score, as did running the game test using the GeForce 6800 card.

Once again, the standard system was capable of running the game at an adequate frame rate for smooth play, but the only card capable of running the game at a 17" LCD monitor's native resolution of 1,280x1,024 pixels is the GeForce 6800.

VERDICT

Our Doom 3 test illustrates how underpowered the standard Radeon X700 is compared even to the previous-generation Radeon 9700 Pro. A graphics card upgrade is definitely needed to experience this game at its best. Far Cry and Chaos Theory are a different matter; our standard system ran both games smoothly, but to boost the resolution to 1,280x1,024 with maximum settings the GeForce 6800 is worth the extra £150. **C**

PROCESSOR UPGRADES

Unlike our other two systems, it is fairly easy to upgrade the Athlon 3200+ processor. Our PC could take any Socket 939 processor, so we upgraded it with an AMD Athlon 64 4000+ to see what difference it made. We then ran each test again with the GeForce 6800 to see if the processor was holding the graphics card back.

Our Doom 3 test ran 5fps faster, but as the original setup was already pushing out more frames than an LCD monitor can display, you wouldn't notice any extra smoothness. There was no improvement over the 3200+ system once we turned on anti-aliasing and ran the ultra-quality test, showing that the graphics card was the bottleneck. Predictably, Far Cry ran faster with the quicker processor in the high-quality test, but it didn't make a great deal of difference with ultra-quality settings. The 4000+ made no difference at all to our Chaos Theory test scores.

Upgrading the processor makes a difference to frame rates when tricks such as anti-aliasing are turned off. However, there's no point in upgrading to a top-specification processor if it only improves performance that's already perfectly adequate and makes no difference to the areas that could do with improvement.